Block 3 Practice Questions

L1

- I can describe current as the rate of flow of charge (how much charge flows each second
- I can state the equation symbols and units for current, charge and time.
- I can use Q = It in calculations showing all lines of working.

1. For each of the following quantities, state the equation symbol and standard unit.

    a. Charge symbol: Q , unit: C (coulombs)

    b. Current symbol: I, unit: A (amperes)

    c. Time symbol: t, unit: s (seconds)

2. State what is meant by a current of 10 A.

    10 C of charge flows by every second

3. Calculate the charge passing through a lamp in 2 **minutes** if the current is 2 A.

    Q = ?
    I = 2A
    t = 2 minutes
    = 2 x 60 s
    = 120 s

    Q = I x t
    Q = 2 x 120
    Q = 240 C

4. Calculate the average current passing through a bulb in 5 seconds if 3 C of charge is transferred.

    Q = 3C
    I = ?
    t = 5 s

    Q = I x t
    3 = I x 5
    ÷5
    I = 3 ÷ 5 = 0.6 A

5. Calculate the number of electrons gained by a Van der Graaf sphere if it has a charge of 4.8 C. Note: e = 1.6 x10^{-19} C.

    N = ?
    Q = 4.8 C
    e = 1.6×10^{-19} C

    $N = \frac{Q}{e}$

    $N = \frac{4.8}{1.6 \times 10^{-19}}$

    N = 3.0×10^{19} electrons

L2

- I can describe power as the rate of energy transfer (amount of energy transferred each second)
- I can state the equations symbols and standards units of power and energy.
- I can use P = E/t in calculations showing all lines of working.

6. For each of the following quantities, state the equation symbol and standard unit.

   a. Power Symbol: P , unit: W (watts)

   b. Energy symbol: E , unit: J (joules)

7. State what is meant by a power of 100 W.

   100 J of energy is transferred every second

8. A lamp is rated at 32 W. How much energy is transferred to the lamp in 2 **minutes**?

   P = 32W
   E = ?
   t = 2 minutes
   = 2 x 60 s
   = 120 s

   $P = \frac{E}{t}$

   $32 = \frac{E}{120}$ ×120

   E = 32 × 120 = 3800 J

9. Calculate the time taken for 3 **kJ** of energy to transfer from electrical to light and heat energy in a 200 W bulb.

   P = 200 W
   E = 3 kJ
   = 3 x 1000 J
   = 3000 J
   t = ?

   $P = \frac{E}{t}$

   $200 = \frac{3000}{t}$ ÷200 ×t

   $t = \frac{3000}{200}$

   = 15 s

L3

- I can state the equations symbols and standards units of resistance and voltage.
- I can use P = V^2/R , P = IV , and P = I^2R in calculations showing all lines of working.

10. For each of the following quantities, state the equation symbol and standard unit.

    a. Voltage symbol : V , unit : V (volts)

    b. Resistance symbol : R , unit : Ω (ohms)

11. Calculate the power dissipated in a 150 Ω lamp connected to a 12 V supply.

P = ?
R = 150 Ω
V = 12 V

$P = \frac{V^2}{R}$

$P = \frac{12^2}{150}$

P = 0.96 W

12. Calculate the resistance of the heating elements in a 3.6 **kW** oven running at 230 V.

P = 3.6 kW
= 3.6 × 1000 W
= 3600 W
R = ?
V = 230 V

$P = \frac{V^2}{R}$

$3600 = \frac{230^2}{R}$

÷3600, ×R

$R = \frac{230^2}{3600}$

R = 15 Ω

13. Calculate the current passing through a food blender with a power rating of 950 W operating using UK mains electricity (230 V).

I = ?
P = 950 W
V = 230 V

P = I × V

950 = I × 230

÷230

$I = \frac{950}{230}$

I = 4.1 A

L4

- I can describe the function of a fuse as a safety device that melts when the current is too high, breaking the circuit.
- I can calculate current using P = IV and select an appropriate fuse rating.

14. Draw the circuit symbol for a fuse.

15. Explain why fuses are used in electrical circuits in houses.

if too much current flows, the fuse melts. This stops circuits overheating which stops fires starting.

16. State the correct size of fuse required for a 9000W oven.

13A

17. State the correct size of fuse required for a 0.35 kW kettle.

3A

18. A food blender draws 1.3 A when operated using mains electricity (230 V, 50Hz).
    a. Calculate the power rating of the blender.

$I = 1.3A$
$V = 230V$
$P = ?$

$P = I \times V$
$P = 1.3 \times 230$
$P = 299W$

    b. State the correct size of fuse required for this blender.

3A

L5

- I can describe the difference between AC and DC in terms of direction of current and how the voltage and current changes with time.
- I can give examples of energy supplies that use AC or DC current.
- I can identify AC and DC waveforms on an oscilloscope trace.

19. State whether the following statements are true or false:

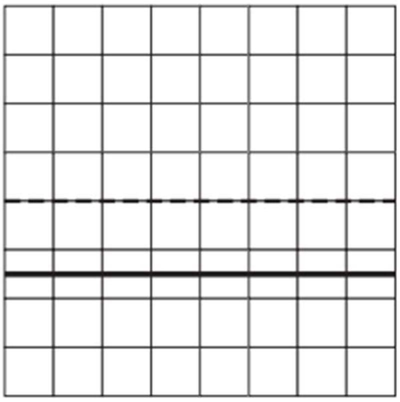
    a. In direct current supplies, the electric charges continually change direction. FALSE

    b. Batteries produce a direct current. TRUE

    c. Alternating current appears as a sinusoidal waveform on an oscilloscope trace. TRUE

    d. In direct current supplies, the size of the voltage changes. FALSE

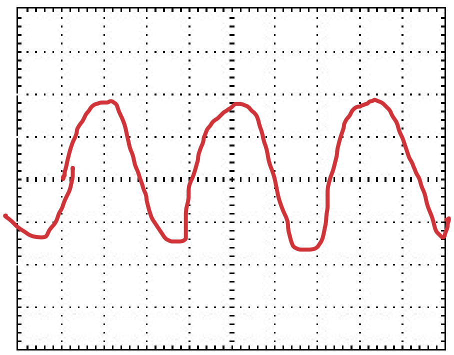
20. Identify the type of waveform from the oscilloscope trace shown below.



D.C.

(direct current)

21. Using the oscilloscope trace below, sketch what an a.c. waveform would look like.



L6

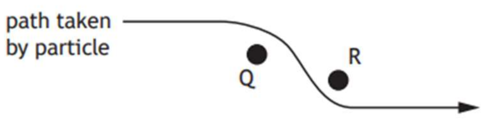
- I can draw and interpret electric field patterns for point charges and opposite charges
- I can state the correct arrow direction when drawing electric field lines (+ to -) and the rules for drawing field lines (do not cross)
- I can predict the direction of a charged particle in an electric field

22.

An electric field exists around two point charges Q and R.

The diagram shows the path taken by a charged particle as it travels through the field.

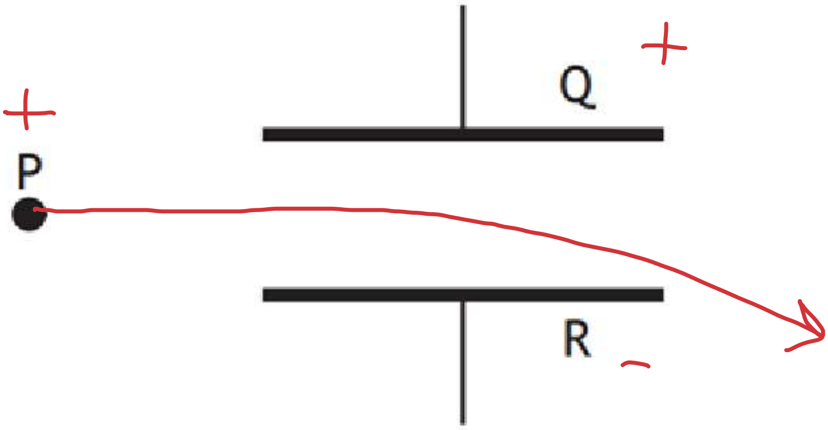
The motion of the particle is as shown.



Which row in the table identifies the charge on the particle, the charge on Q, and the charge on R?

	Charge on particle	Charge on Q	Charge on R
A	positive	negative	negative
B	negative	negative	positive
C	negative	positive	negative
D	positive	negative	positive
E	positive	positive	positive

24. Complete the following diagram showing the path that a **positively charged particle P** would take if **plate Q was positive** and **plate R was negative**.



25. Complete the following diagram showing the electric field lines between a pair of point charges where **charge P is positive** and **charge Q is negative**.